

CASE STUDY: Sub-Bituminous Coal

TIVAR® 88 High Performance Lining Solution

THE CASE IN BRIEF

Application: 250-ton Railcar Receiving Bunkers

Quantity: 2 Bunkers

Liner: TIVAR® 88-2, 3/4" Thick

Bulk Material: Sub-Bituminous Coal (PRB)

Substrate: Gunitite

Problem: Coal sticking, hang-up and stagnation

Date Installed: 1986

COAL FLOWS RELIABLY AFTER INSTALLING TIVAR® 88 LINERS IN CONCRETE RAILCAR RECEIVING BUNKERS

Background: The Xcel Energy (formerly Northern States Power) Black Dog Power Plant, located in Burnsville, Minn., is a coal-fired facility that burns a low sulfur, sub-bituminous coal from Wyoming and Montana. The coal receiving system consisted of two 250-ton hoppers that were located below ground in an outdoor railcar receiving shed. The hoppers were fed through a grizzly by bottom dump railcars and tractor scrapers that retrieved coal from an outdoor stockpile. The hoppers themselves were constructed of concrete in a wedge-shaped design with sloping wall angles of 50-52° from horizontal. Coal was discharged from each hopper through a 5' x 5' square outlet at a rate of 600 to 800 tons per hour onto a 60" wide belt conveyor (Fig. 1).

Problem: The two primary coal receiving hoppers did not provide consistent discharge of the 4" x 0 sub-bituminous coal. As a result, plant personnel were forced to poke the coal with steel rods to maintain material flow - an extremely inefficient, costly and unreliable method of operation.

In early 1986, Xcel Energy contracted with Abe W. Mathews Engineering Company to develop a solution to the flow problems existing in the coal receiving hoppers. Following an evaluation of the coal receiving system, Abe Mathews Company determined the flow problems were the result of three elements working in conjunction that caused the coal to stick and cling to the hopper sidewalls and build to the no-flow point.

The first element was the shallow angle of the hopper walls - only 50°-52° from horizontal. The second element was the condition of the interior wall. The concrete surface was pitted and porous enough to serve as a deterrent to material flow. The final element was the condition of the coal. The coal being fed into the hoppers had a high percentage of moisture due to outdoor stockpiling, transportation and winter snow.

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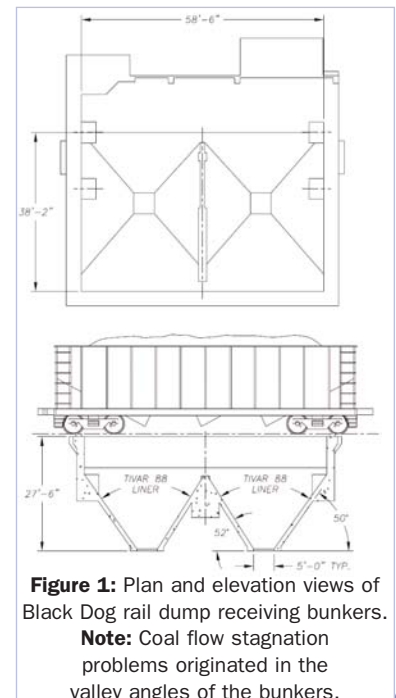


Figure 1: Plan and elevation views of Black Dog rail dump receiving bunkers.
Note: Coal flow stagnation problems originated in the valley angles of the bunkers.



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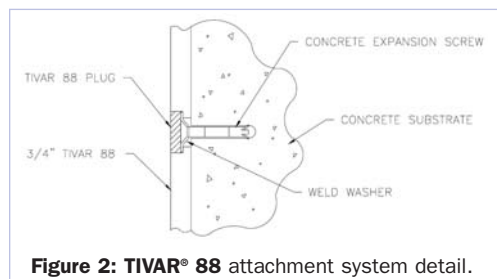
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Solution: Abe Mathews Company's recommendation was to install TIVAR® 88 liners on the sloping walls of the concrete bunkers. TIVAR® 88 liners, with their low coefficient of friction and non-stick surface, would cover the pitted concrete, as well as compensate for both the shallow wall angles and the stickiness of the high-moisture coal. In 1987, 3/4"-thick TIVAR® 88 liners were installed in the receiving hoppers by a certified Quadrant Engineering Plastic Products contractor. All fasteners were countersunk and protected with a TIVAR® plug (Fig. 2) to provide a smooth surface for the flowing coal.

Results: The extremely low surface friction of TIVAR® 88 liners dramatically improved the coal flow through the receiving hoppers. The need for rodding the coal to stimulate material flow was reduced from an everyday occurrence to once or twice a year. The TIVAR® 88 liners also serve as an excellent wear surface.

The TIVAR® 88 liners showed no visible signs of wear even after 1,000,000 tons of coal had been conveyed through each hopper. Black Dog Plant personnel were so impressed by the results of the TIVAR® 88 liners in this application that they have installed TIVAR® 88 liners in other chutes and hoppers.



Important: Most plastics will ignite and sustain flame under certain conditions. Caution is urged where any material may be exposed to open flame or heat generating equipment. Use Material Safety Data Sheets to determine auto-ignition and flashpoint temperatures of material or consult Quadrant Engineering Plastic Products.

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